

## Two new species of *Dysponetus* (Polychaeta: Chrysopetalidae) from Italy and Papua New Guinea

Thomas G. Dahlgren

Department of Zoology, Göteborg University, Medicinaregatan 18, S-413 90 Göteborg, Sweden  
Address for correspondence: Tjärnö Marine Biological Laboratory, S-452 96 Strömstad, Sweden

*Abstract.*—*Dysponetus bipapillatus*, new species, and *D. macroculatus*, new species, are described from shallow sediments in the Bay of Naples, Italy, and from the Madang area, Papua New Guinea, respectively. Comparisons are made with other *Dysponetus* species. *Dysponetus bipapillatus* appears closely related to *D. caecus* (Langerhans, 1880) and *D. macroculatus* to *D. bidentatus* Day, 1954. *Dysponetus bipapillatus* is unique in having a pair of papillae on segment 8 on some of the examined specimens, and *D. macroculatus*, in the combination of large distinct eyes and presence of ventral tentacular cirri on segment 2.

The family Chrysopetalidae Ehlers, 1864 currently includes 43 species, referred to 11 genera (Dahlgren & Pleijel 1995). Most chrysopetalids are easily distinguished from other polychaetes in that they possess chambered, flattened notosetae (paleae) more or less covering the dorsum, giving the characteristic golden color. They are commonly found in shallow waters, in temperate or tropical areas, often in association with corals. One group of small (1–5 mm) forms found in sediments, however, have circular rather than flattened notosetae. Three such genera have been described: *Dysponetus* Levinsen, 1879; *Acanthopale* San Martín, 1986; and *Victoriella* Kisseleva, 1992. *Acanthopale* is distinguished from *Dysponetus* by the presence of a mouth cover and a caruncle, both of which are similar to those found in chrysopetalids with flattened paleae. *Victoriella* is characterized by the absence of median antennae, and the presence of biramous first segment, platelate jaws and paired pygidial cirri.

*Dysponetus* currently includes six species described from the Atlantic, and one from the Indian Ocean (see appended checklist). *Dysponetus* species are small, fragile and easily overlooked in normal handling of samples. They are characterized by circular

notosetae, mouth appendage, single pygidial projection, and accessory simple neurosetae.

In this paper two new *Dysponetus* species from Ischia, near Naples in Italy, and Madang, Papua New Guinea are described. The generic assignment is based on results from a cladistic analysis on *D. caecus* (Langerhans, 1880) and type species of ten chrysopetalid genera (Dahlgren & Pleijel 1995). *Dysponetus bipapillatus*, new species, and *D. macroculatus*, new species, share two of the three character state-changes that separate the clade *D. pygmaeus*-*D. caecus* from the next closest chrysopetalid taxon, i.e., absence of paired pygidial cirri and presence of single pygidial projection. Additional potential synapomorphies for *Dysponetus* are discussed. Further phylogenetic considerations have to await results from ongoing studies treating the relationship within Chrysopetalidae and related families. Type material is deposited at the Swedish Museum of Natural History, Stockholm.

### Materials and Methods

Sediment samples were collected in fine mesh net bags during SCUBA dives. Spec-

imens were carefully extracted using a suspension-decantation method, collected on 100 or 250- $\mu\text{m}$  mesh screen, relaxed with magnesium chloride (7% in distilled water), studied alive, fixed for a few days in 10% formalin in filtered sea water, rinsed in tap water and stored in 80% alcohol. SEM specimens were similarly relaxed, fixed for a few hours in osmium tetroxide (1% in artificial sea water), rinsed in distilled water, and transferred to 100% alcohol in a graded series, critical-point dried with  $\text{CO}_2$ , mounted on aluminium stubs, sputter-coated with gold, and examined in a Zeiss DSM 950. Drawings were made from SEM micrographs (Fig. 1A), or with a camera lucida (Figs. 1B–D; 3A, B; 6A–E).

All measurements were carried out, either on live, relaxed specimens, or on specimens relaxed prior to preservation.

Institutions, museums and other collections are indicated by following abbreviations: CMNA (Canadian Museum of Nature); LACM-AHF (Los Angeles County Museum of Natural History, Allan Hancock Foundation); SMNH (Swedish Museum of Natural History, Stockholm, Sweden); TD (author's collection); USNM (United States National Museum, Smithsonian Institution, Washington D.C.); ZISP (Zoological Institute, Academy of Sciences of Russia, St Petersburg); ZMH (Universität Hamburg, Zoologisches Institut und Museum); ZMUC (Zoological Museum, University of Copenhagen, Denmark).

*Dysponetus bipapillatus*, new species  
Figs. 1–5

*Material examined*.—Italy: Ischia, off Ischia harbor, 40°45.3'N, 13°55.8'E, 9 m, SCUBA, "Amphioxus sand", holotype (SMNH 4789), 9 Jul 1994; 11 paratypes (SMNH 4790), 9 Jul 1994; 4 specimens used for SEM, 9 Jul 1994; 1 paratype (SMNH 4791), 15 Jul 1994; 1 specimen mounted on slide (TD), 15 Jul 1994.

*Description*.—Body, excluding parapodia, cylindrical; venter flattened. Posterior

segments successively smaller, resulting body shape of fairly constant width, slightly posteriorly tapered.

Prostomium rectangular, longer than wide. Four minute eyes visible in live specimens, posterior pair larger and more widely separated. Anterior pair not visible in fixed specimens. Median antenna half length of lateral antennae, digitiform, anterodorsally inserted on prostomium. Lateral antennae fusiform, inserted immediately dorsal to palps (Fig. 1A). Antennae without distinct ceratophores. Palps stout, oval, twice as long as wide, not extending ventrally (Fig. 1A). Nuchal organs present as pair of ciliated lateral patches inserted posteriorly on prostomium.

Pronounced single mouth appendage on lower lip, extending anteriorly, slightly conical, with blunt tip (Fig. 1A). Single pair of stylet-shaped jaws (length 60  $\mu\text{m}$ ), visible through body wall in live specimens. Pharynx visible through body wall, extending to segment 6. Everted proboscis not observed.

First two segments with four pairs tentacular cirri, longer than but with same shape as, dorsal cirri of third and following segments, anteriorly directed (Fig. 1A). First segment achaetous, visible lateral to prostomium, slightly ventrally dislocated; second segment with notosetae only (Fig. 1A). Third segment biramous; dorsal cirri present, ventral cirri absent (Figs. 1A; 3B). Biramous segments from segment 4, all with dorsal and ventral cirri (Fig. 1B). Single noto- and neuroacicula present from segment 2 (Fig. 1B); aciculae in segment 1 not detectable.

Notopodial lobes reduced. Dorsal cirri fusiform, as long as setae (length 130  $\mu\text{m}$  in median segments), cirrophores present, styles slightly proximally inflated, distally tapering, tips blunt. Notoaciculae difficult to detect in dense notosetal fascicle, length 70  $\mu\text{m}$  (Fig. 1B). Notosetae internally chambered, D-shaped in cross-section, 10–15 denticles on each side, dorsally (Fig. 2A). Notosetal count, mid-body segments

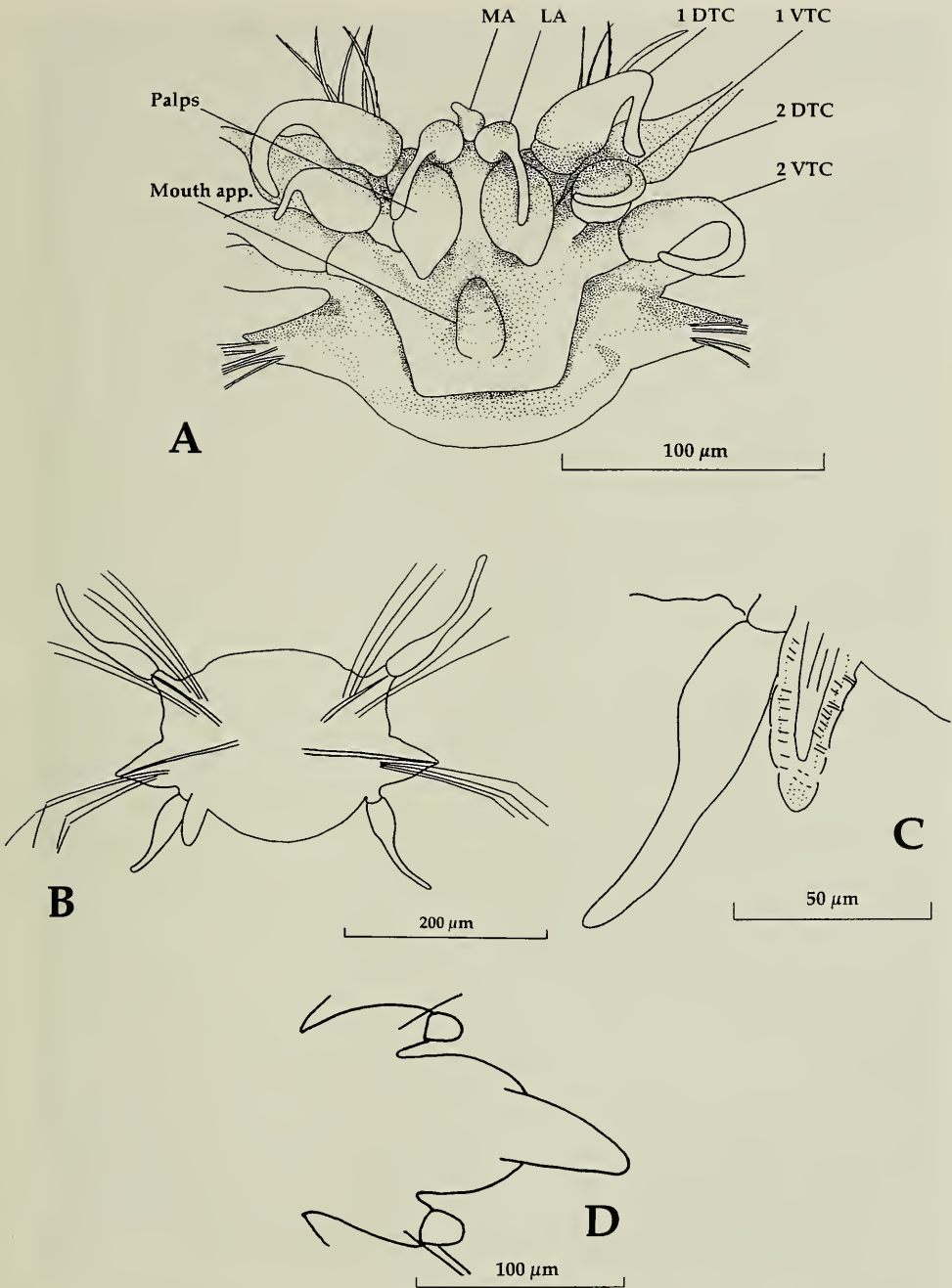


Fig. 1. *Dysponetus bipapillatus*, new species. A, anterior end, anteroventral view; B, segment 8, anterior view, ca. half the number of setae shown. Right papilla lost; C, papilla, left side of segment 8, anterior view; D, pygidium, ventral view. Abbreviations.—MA, median antenna; LA, lateral antenna; DTC, dorsal tentacular cirri; VTC, ventral tentacular cirri.

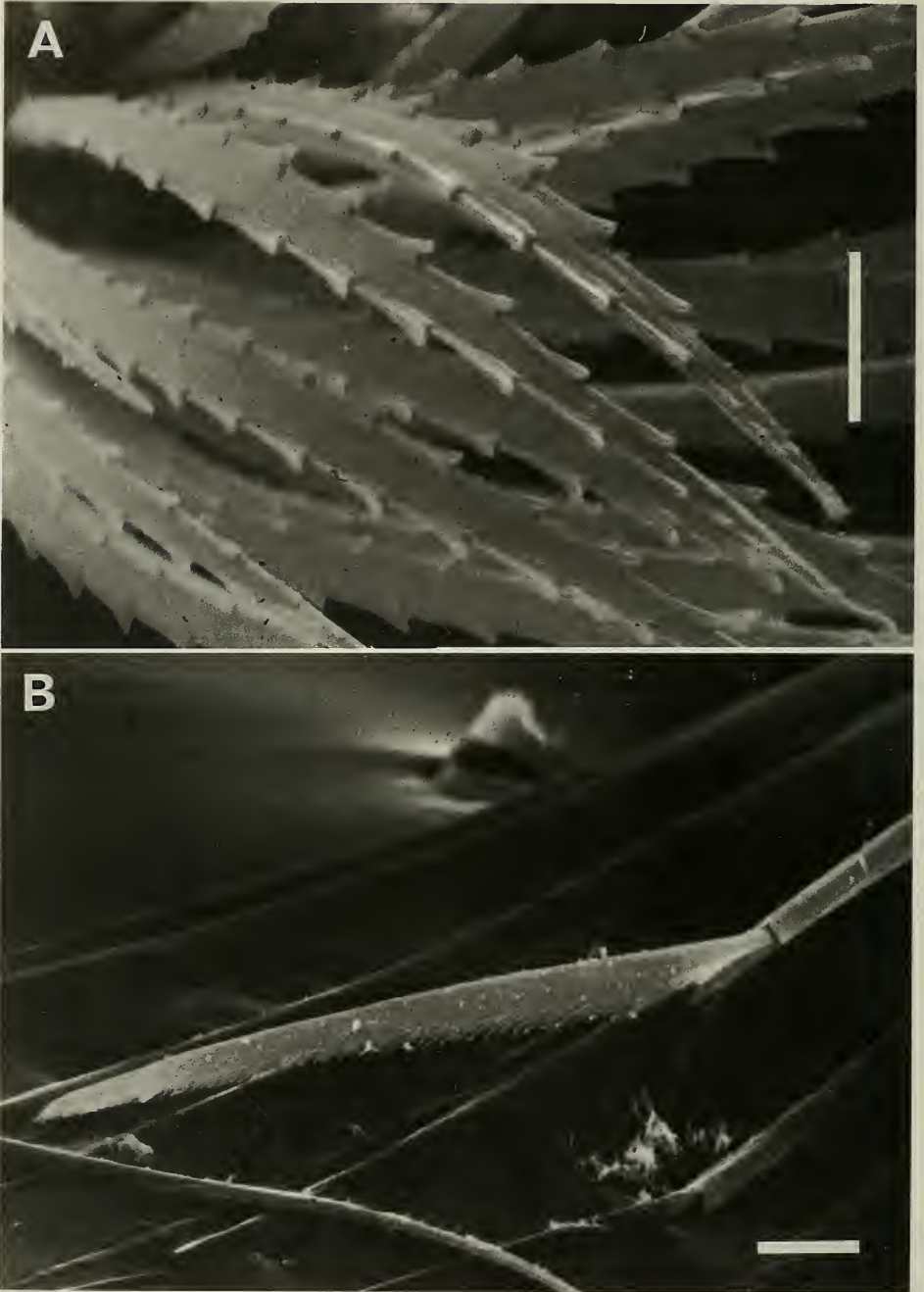


Fig. 2. *Dysponetus bipapillatus*, new species. A, notosetae, midbody segment, dorsal view; B, neuroseta, midbody segment, posterior view. Scale bars equal 10  $\mu\text{m}$  (A), and 5  $\mu\text{m}$  (B).

Table 1.—Summary of some morphological characters for described *Dysponetus* species.

Species	Tentacular segments formula			Eyes	Median antenna	Shape of palps	Mouth appendage	Accessory neurosetae
<i>Dysponetus bidentatus</i> Day, 1954	$\frac{0-1}{0-1}$	$\frac{S-1}{0-0}$	$\frac{S-N}{S-0}$	4	Dorsal	Elongated	Single	?
<i>D. bipapillatus</i> , new species	$\frac{0-1}{0-1}$	$\frac{S-1}{0-1}$	$\frac{S-N}{S-0}$	4	Anterior	Elongated	Single	Present
<i>D. bulbosus</i> Hartmann- Schröder, 1982	$\frac{S-1}{0-0}$	$\frac{S-1}{S-?}$	$\frac{S-N}{S-N}$	4	Anterior	Elongated	?	?
<i>D. caecus</i> (Langerhans, 1880)	$\frac{0-1}{0-1}$	$\frac{S-1}{0-1}$	$\frac{S-N}{S-N}$	0	Anterior	Elongated	Single	Present
<i>D. gracile</i> Hartman, 1965	$\frac{0-1}{0-0}$	$\frac{S-1}{S-1}$	$\frac{S-N}{S-N}$	0	Dorsal	Sphaerical	?	?
<i>D. hebes</i> (Webster & Benedict, 1887)	$\frac{0-1}{0-0}$	$\frac{S-1}{S-?}$	$\frac{S-N}{S-?}$	2	Anterior	Sphaerical	Double	?
<i>D. macroculatus</i> , new species	$\frac{0-1}{0-1}$	$\frac{S-1}{0-1}$	$\frac{S-N}{S-0}$	4	Anterior	Elongated	Single	Present
<i>D. Paleophorus</i> Hart- mann-Schröder, 1974a	$\frac{0-1}{0-0}$	$\frac{S-1}{S-0}$	$\frac{S-N}{S-N}$	0	Dorsal	Sphaerical	Absent	Present
<i>D. pygmaeus</i> Levinsen, 1879	$\frac{0-1}{0-0}$	$\frac{S-1}{S-0}$	$\frac{S-N}{S-N}$	0	Dorsal	Sphaerical	Double	Present

23–28. Notosetal fascicles separated, leaving middle part of dorsum exposed.

Neuropodia well-developed. Compound neurosetae, with heterogomph shafts, and fine bidentate falcigerous blades (Fig. 2B). Neurosetal count, mid-body segments 9–13. One or two accessory simple setae, similar to but smaller than notosetae, present from segment 7, inserted distally and anteriorly on neuropodial lobe. Ventral cirri fusiform, shorter than dorsal cirri (length 100  $\mu\text{m}$  in segments 7 & 8, 40–70  $\mu\text{m}$  in others), inserted posteroventrally on neuropodial lobe, visible on live specimens in dorsal view. Some specimens of 10 or more segments possess single pair of digitiform appendages inserted proximal to ventral cirri in segment 8 (length 50  $\mu\text{m}$ ), internally possibly with ducts and duct openings (Fig. 1B, C; see Remarks).

Pygidium conical with single projection (length 50  $\mu\text{m}$ ), cylindrical, slightly distally tapering, inserted posteroventrally (Fig. 1D).

*Color*.—Live specimens colorless, transparent with red eyes. Preserved specimens white, eyes brown.

*Reproduction*.—No eggs or sperm visible in any specimens. Possible external genital organs on segments 8 in 3 out of 10 specimens with 10 or more segments.

*Measurements*.—Largest specimen 1.1 mm for 13 segments (Fig. 4). Length of holotype, 0.73 mm for 11 segments.

*Habitat*.—Found in relatively “clean” “*Amphioxus* sand” with wave ripples near large colonies of *Polysiphonia* sp.

*Distribution*.—Known only from Ischia, Bay of Naples, Italy.

*Remarks*.—Anterior (tentacular) segments and characters associated with cephalization exhibit variations within the chrysopetalids (Table 1). Perkins (1985:862) stated that when ventral cirri are lost in the ontogeny during cephalization, they are lost from segment 2 or segments 2 and 3. Adults (11–15 segments) of *D. bipapillatus* have ventral cirri on achaetous segment 1 and uniramous segment 2, but ventral cirri are absent on biramous segments 3 (Fig. 1A). Juvenile specimens of 9-segments have a biramous segment 2 with numerous noto- and neurosetae, but lacking ventral cirri (Figs. 3A; 5A). In 10-segment juveniles,

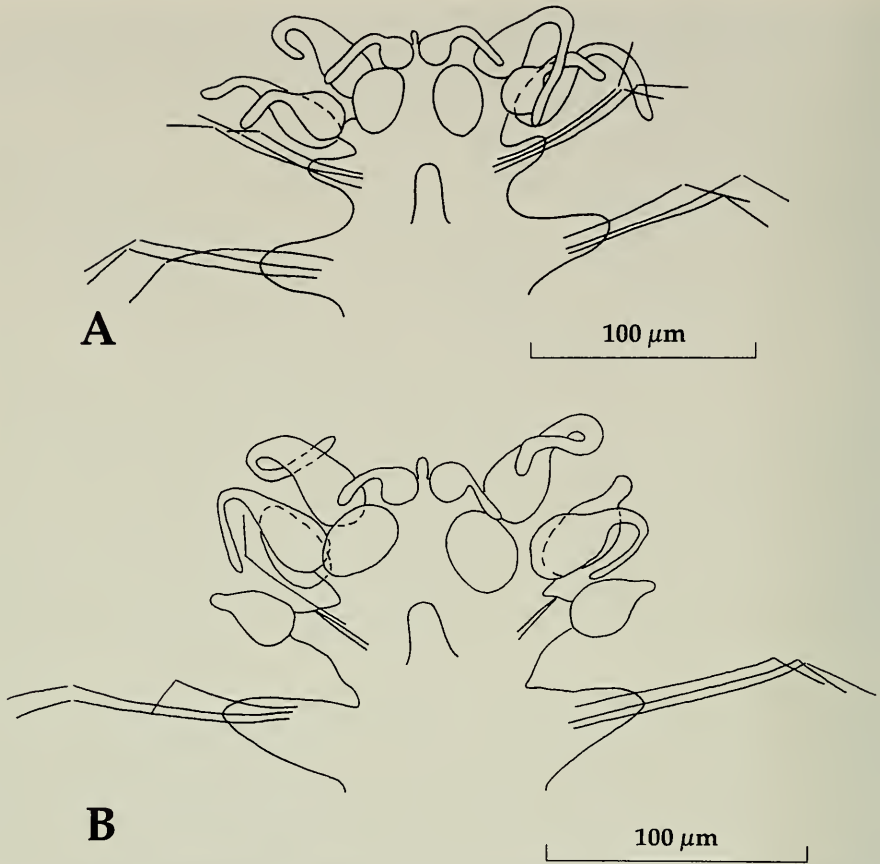


Fig. 3. *Dysponetus bipapillatus*, new species. A, 9 segment specimen, anterior end, ventral view; B, 10 segment specimen, anterior end, ventral view.

most neurosetae of segment 2 are absent, and ventral cirri present (Figs. 3B; 5B). A similar development was described for the chrysopetalid *Paleanotus bellis* (Johnson, 1897) by Blake (1975). This indicates that setae are lost from segments 1 and 2, ventral cirri of segment 2 develop in a late stage, and that ventral cirri of segment 3 are never present during ontogeny (Fig. 5). Late development of ventral cirri of segments 2 and 3, as well as development of tentacular segments from anterior setigers, is also reported for some hesionids (Haaland & Schram 1982, 1983; Schram & Haaland 1984).

The digitiform appendages found ventrally on segment 8 in some of the specimens (3 out of 10 specimens with 10 or

more segments) are presently a unique feature within the Chrysopetalidae (Fig. 1B, C). Similar appendages were recently described for an interstitial hesionid which function as genital organs, as indicated by ultrastructural evidence (Westheide et al. 1994). Ultrastructural information, however, from *Dysponetus bipapillatus* is lacking, and the matter needs further investigation.

*Dysponetus bipapillatus* is similar to other *Dysponetus* species by the presence of serrated but not flattened notosetae, and a single pygidial projection. The accessory setae, present also in *D. pygmaeus*, *D. paleophorus* Hartmann-Schröder, 1974a, *D. caecus* (Dahlgren & Pleijel 1995) and *D. macroculatus*, new species (see below), are difficult to detect in normal parapodial

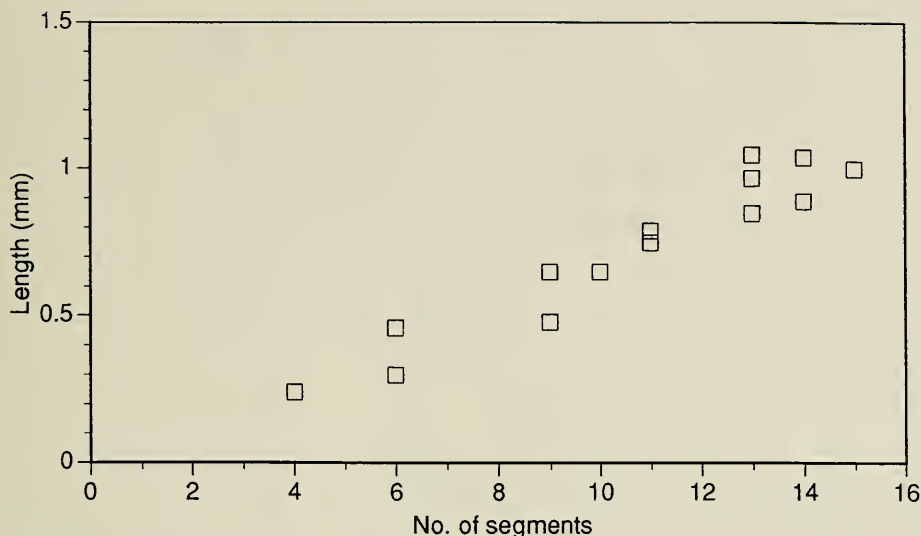


Fig. 4. *Dysponetus bipapillatus*, new species. Relationship between number of segments and length (mm).

preparations and require SEM for proper determination, which may explain why they have not been reported for other *Dysponetus* species. Further, *D. bipapillatus* is similar to *D. bidentatus*, *D. caecus* and *D. macroculatus* by the presence of two pairs of tentacular cirri on the first segment, uniramous second segment, and a single mouth appendage on the posterior mouth margin (Table 1).

Although no visible sexual products were present in any of the specimens, the onto-

genetic development of anterior segments described above, and the presence of papillae on segment 8 in some of the specimens, here interpreted as genital organs, strongly suggest that the present description is based on adults.

*Etymology.*—The species name is derived from the Latin words *bi* meaning two, and *papillatus* which refers to the presence of papillae on segment 8 in some of the specimens.

*Dysponetus macroculatus*, new species  
Figs. 6–7

*Material examined.*—Papua New Guinea: N. Madang, 05°10.3'S, 145°50.6'E, 10 m, SCUBA, clean sand with *Halimeda* remains, 3 paratypes (SMNH 4793), 26 Dec 1994; 1 specimen mounted on slide, 26 Dec 1994; holotype (SMNH 4792), 3 Jan 1995; 3 paratypes (SMNH 4794), 3 Jan 1995; 1 specimen used for SEM, 3 Jan 1995; 1 specimen mounted on slide, 3 Jan 1995.

*Description.*—Body, excluding parapodia, cylindrical; venter flattened. Posterior segments successively smaller, resulting body shape of fairly constant width, slightly tapered posteriorly.

Prostomium rectangular, longer than

$$\frac{0-1}{0-1} + \frac{S-1}{S-0} + \frac{S-1}{S-0} \quad \mathbf{A}$$

$$\frac{0-1}{0-1} + \frac{S-1}{S-1} + \frac{S-1}{S-0} \quad \mathbf{B}$$

$$\frac{0-1}{0-1} + \frac{S-1}{0-1} + \frac{S-1}{S-0} \quad \mathbf{C}$$

Fig. 5. Formulae showing setal (S) and tentacular (1) distribution on first three segments of *Dysponetus bipapillatus*, new species. A, 9 segment stage; B, 10 segment stage; C, adult stage.

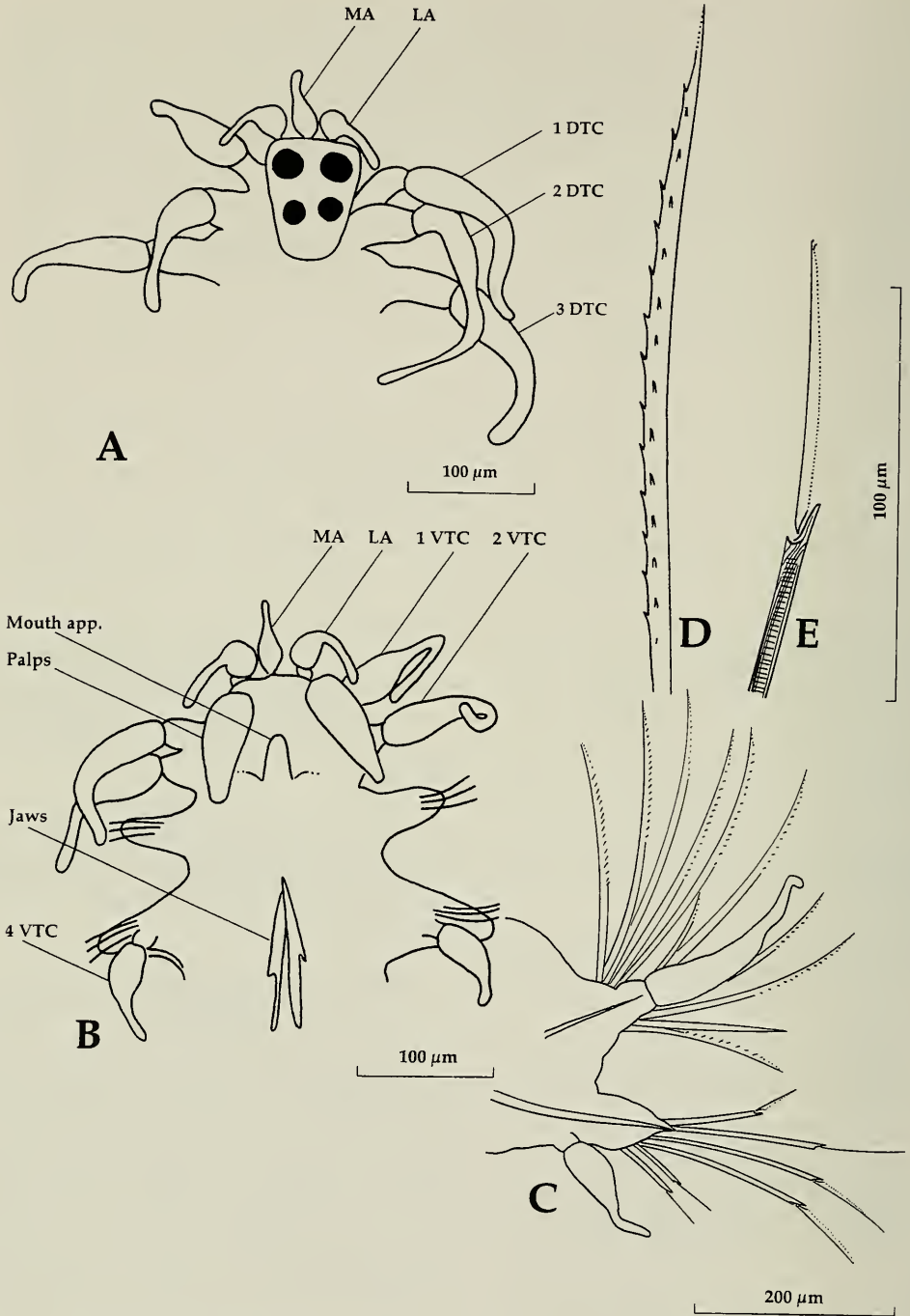


Fig. 6. *Dysponetus macroculatus*, new species. A, anterior end, dorsal view; B, anterior end, ventral view; C, midbody parapodium, anterior view (for clarity only half of number of setae drawn); D, notoseta (internal structures not illustrated); E, neuroseta. Abbreviations.—See Fig. 1.



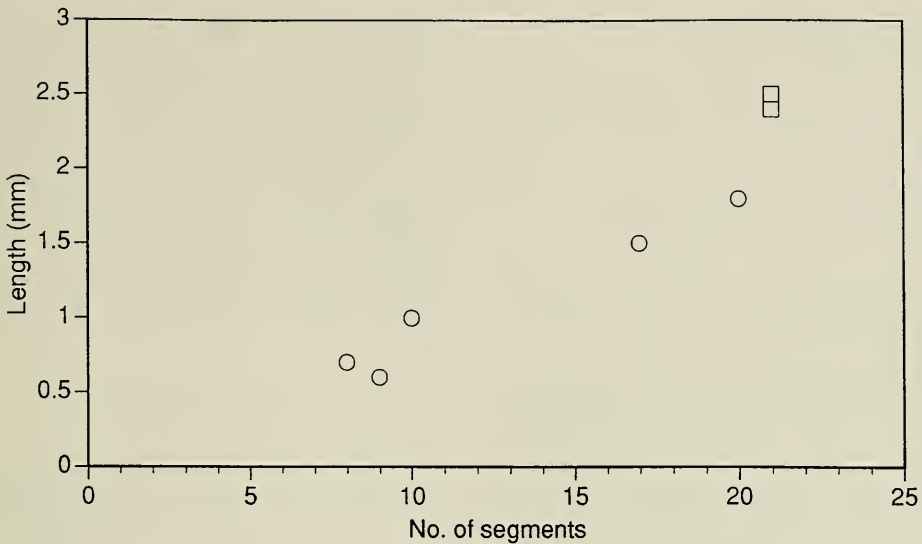


Fig. 7. *Dysponetus macroculatus*, new species. Relationship between number of segments and length (mm). Circles indicate entire specimens; squares incomplete specimens.

wide. Two pairs of large, rounded eyes, posterior pair smaller and closer together (Fig. 6A). Median antenna fusiform, inserted anterior to anterior pair of eyes (Fig. 6A). Lateral antennae fusiform, twice length of median antenna, inserted immediately dorsal to palps (Fig. 6B). Antennae without distinct ceratophores. Palps short, stout, inserted anteroventrally on prostomium, folded backwards ventrally, reaching about segment 2 (Fig. 6B); palpophores short. Nuchal organs not observed.

Single mouth appendage inserted on lower lip, anteriorly extended, subconical, with blunt tip (Fig. 6B). Single pair of stylet-shaped jaws (length 110  $\mu\text{m}$ ), visible through body wall in live specimens (Fig. 6B). Pharynx visible through body wall, extending to segment 6. Everted proboscis not observed.

First two segments with four anteriorly directed pairs tentacular cirri, longer but with same shape as, dorsal cirri of third and following segments (Fig. 6A, B). Segment 1 achaetous; segment 2 with notosetae only. Segment 3 biramous with dorsal cirri; ventral cirri absent (Fig. 6B). Biramous segments from segment 4 on with dorsal and

ventral cirri (Fig. 6C). Single noto- and neuroacicula present from segment 2 (Fig. 6C); aciculae not detectable in segment 1.

Notopodial lobe well-developed. Dorsal cirri as long as setae, with cirrophores, proximally slightly inflated, distally tapering with blunt tips (Fig. 6C). Notopodial acicula faintly visible in dense notosetal fascicle. Notosetae internally chambered (not illustrated), with 15–17 pairs of fine denticles (Fig. 6D). Notosetal count, mid-body segments 23–28. Notosetal fascicles covering most of dorsum.

Neuropodium well-developed. Compound neurosetae with heterogomph shaft and bidentate falcigerous blades (Fig. 6E). Neurosetal count, mid-body segments 19–22. Single accessory simple setae, similar to but smaller than notosetae, present in midbody segments, inserted distally and anteriorly on neuropodial lobe. Ventral cirri short, fusiform (Fig. 6C).

Pygidium shape rounded, similar to *D. bipapillatus*. Single median pygidial projection, inserted on posteroventral edge of pygidium.

*Color*.—Live specimens without pig-

mentation, eyes red, eggs white. Preserved specimens white.

*Reproduction.*—Specimens with mature eggs ( $\phi = 100 \mu\text{m}$ ) and sperm found in Papua New Guinea in December.

*Measurements.*—Largest specimen 2.5 mm for 21 segments (Fig. 7). Length of holotype, 2.4 mm for 21 segments.

*Habitat.*—Shallow water near coral reefs in clean sand with *Halimeda* remains.

*Distribution.*—Known only from the Madang area, Papua New Guinea.

*Remarks.*—*Dysponetus macroculatus* is similar to other *Dysponetus* species in the presence of serrated but not flattened notosetae and a single pygidial cirrus and the presence of simple accessory setae in the neuropodial lobe (see remarks for *D. bipapillatus*). *D. macroculatus* is similar to *D. bidentatus* Day in the presence of two pairs of large, red eyes, the absence of ventral cirri on segment 3, and the presence of bidentate neurosetal falcigers, but differs in the presence of ventral tentacular cirri on segment 2, and absence of ventral cirri on segment 3 (Table 1).

Specimens carrying eggs and sperm indicate that the description is based on adult characters.

*Etymology.*—The species name is derived from the combination of Latin terms *macro* and *oculatus*, meaning provided with large eyes.

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## Appendix

Checklist of species of *Dysponetus*, with notes on material examined and major references.

*Dysponetus* Levinsen, 1879. Type species *Dysponetus pygmaeus* Levinsen, 1879, by monotypy.—Annenkova 1935.

*D. bidentatus* Day, 1954. Tristan da Cunha. Type material? Syntype 1955.3.20.7 at BMNH lost (A. Muir, in litt). No type material examined.—Hartmann-Schröder 1974b.

*D. bipapillatus*, new species. Ischia, Italy. Holotype (SMNH), paratypes (SMNH) and non-types (TD) examined.

*D. bulbosus* Hartman-Schröder, 1982. Cape Naturaliste, Australia. Holotype (ZMH) and non-types (ZMH) examined.—Hartmann-Schröder 1986, 1993.

*D. caecus* (Langerhans, 1880). As *Chrysopetalum caecum*. Madeira. Neotypes (SMNH) and non-types (TD) examined.—Laubier 1964, 1968; Dahlgren & Pleijel 1995.

*D. gracilis* Hartman, 1965. Off New England. Holotype (LACM-AHF) and non-types (LACM-AHF) examined.

*D. hebes* (Webster & Benedict, 1887). As *Taphus hebes*. Maine. Holotype (USNM) examined.—Annenkova 1935.

*D. macroculatus*, new species. Papua New Guinea. Holotype (SMNH), paratypes (SMNH) and non-types (TD) examined.

*D. paleophorus* Hartman-Schröder, 1974a. Norwegian Trench. Holotype (ZMH) and non-types (TD) examined.

*D. pygmaeus* Levinsen, 1879. Egedesminde, Grønland. Holotype (ZMUC) and non-types (ZISP, CMNA, TD) examined.—Annenkova 1935; Imajima & Hartman 1964.